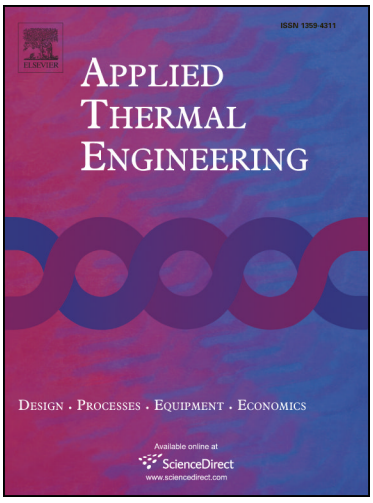

Multi-objective optimization of shell-and-tube heat exchanger by constructal theory

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Multi-objective optimization of shell-and-tube heat exchanger by constructal theory

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Abstract

Shell and tube heat exchanger is one of the most common exchangers which is wieldy used in industrial applications. The thermal efficiency and cost are two most important parameters in the design of the heat exchangers, while the optimization of both parameters is complicated, since they are in the conflict with each other. To tackle this problem, a multi-objective optimization algorithm, considering simultaneously cost and effectiveness as the objective functions, has been applied in this study. Meanwhile, the bounds for the decision variables are rigorously followed during the optimization of the objective functions (maximum effectiveness and minimum total cost), which is more realistic for an engineering design. To find the optimal values of the objective functions, a genetic algorithm, coupling with the constructal theory, has been used to adjust mechanical and flow parameters. The results of the optimization show that the increase in the thermal efficiency is more than 28%, which proves that the constructal theory can be used as an efficient method for designing the shell-and-tube heat exchanger.

Keywords: Optimization; Shell and tube Heat exchanger; Constructal theory; Genetic Algorithm.